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09/890,143	07/26/2001	Masaki Yamamoto	SHIG19990241	7584

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EXAMINER	
KAO, CHIH CHENG G	

ART UNIT	PAPER NUMBER
2882	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/890,143	YAMAMOTO, MASAKI	
	Examiner	Art Unit	
	Chih-Cheng Glen Kao	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 July 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *31-59* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *37* is/are allowed.

6)☒ Claim(s) *31-36 and 38-59* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 31-36 and 38-58 are objected to because of the following informalities, which appear to be minor draft errors including grammatical and/or lack of antecedent problems.

In the following format (location of objection; suggestion for correction), the following correction(s) may obviate the objection(s): (claim 31, line 13, "more than one alternating layers"; replacing "layers" with --layer--), (claim 38, line 7, "more than one pairs"; replacing "pairs" with --pair--), (claim 48, line 7, "more than one pairs"; replacing "pairs" with --pair--), and (claim 49, line 7, "more than one pairs"; replacing "pairs" with --pair--).

Claims 32-36, 39-47, 50-58 are objected to by virtue of their dependency. For purposes of examination, the claims have been treated as such. Appropriate correction is required.

Claim Rejections - 35 USC § 102

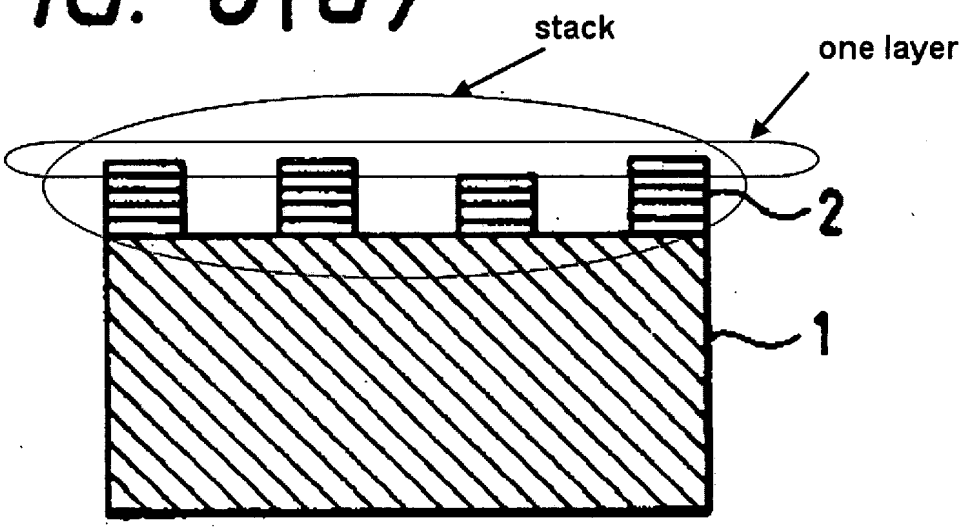
The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 31, 32, 38, 39, 42-44, 46, 48-50, 53-55, and 57 are rejected under 35 U.S.C. 102(b) as being anticipated by Itou et al. (US 5272744).

3. Regarding claims 31, 49, and 50, Itou et al. discloses a method comprising forming on a substrate (fig. 6d, #1) a multilayer film stack (fig. 6d, #2) of alternating layers of high refractive index material and low refractive index material (col. 5, lines 16-20), and cutting away a portion of the multilayer film stack (fig. 6c, #2) so that at least one layer successively arranged from an outermost surface of the multilayer film stack has a predetermined portion in which material of the respective layer does not exist (fig. 6c, #2) so that the respective layer is thereby non-uniform across the multilayer film stack (fig. 6d, #2), wherein the multilayer film stack, having said portion cut away, reflects radiation in a range from vacuum ultraviolet through X-ray (col. 1, lines 5-7), more than one alternating layer of high refractive index material and low refractive index material of the multilayer film stack (fig. 6d, #2), having said portion cut away, necessarily adjusts a wavefront phase of emerging rays, and said cutting away cuts away said portion in accordance with an amount of adjustment of the wavefront phase (col. 5, lines 37-46).

FIG. 6(d)



4. Regarding claims 32, 42, 53, and 54 Itou et al. further discloses wherein the multilayer film stack is formed in a number of cycles larger than that necessary to saturate a reflectance (col. 5, lines 41-43).

5. Regarding claim 38, Itou et al. discloses a multilayer film reflection mirror that reflects radiation in a range from vacuum ultraviolet through X-ray (col. 1, lines 5-7) comprising: a multilayer film (fig. 6d, #2) formed by a plurality of repeated pairs of layers, layers of each pair of layers having different refractive indexes from each other (col. 5, lines 16-20), at least one layer successively arranged from an outermost surface of the multilayer film having a predetermined portion in which material of the respective layer does not exist (via cutting in fig. 6c) so that the respective layer is thereby non-uniform across the multilayer film (fig. 6d, #2), and more than one pair of layers among said plurality of repeated pairs of layers necessarily adjusting a wavefront phase of a light reflected by said multilayer film (fig. 6d, #2).

6. Regarding claim 39, Itou et al. further discloses wherein said wavefront phase is adjusted with more than one layer among said plurality of repeated pairs being partially removed (col. 5, lines 26-29).

7. Regarding claim 43, Itou et al. further discloses wherein said wavefront phase is adjusted with more than one layer among the pairs of layers where the reflectivity is already saturated (col. 5, lines 41-43) being partially removed (fig. 6d, #2).

8. Regarding claims 44 and 55, Itou et al. further discloses wherein reflectivity of said multilayer film is between about 15% and about 80% (col. 5, lines 41-43).

9. Regarding claims 46 and 57, Itou et al. further discloses wherein said multilayer film is formed by pairs of molybdenum and silicon layers (col. 5, lines 16-20).

10. Regarding claim 48, Itou et al. further discloses an exposure apparatus (col. 1, lines 5-7).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itou et al. as applied to claim 31 above, and further in view of Sweeney et al. (US 6235434).

Itou et al. as recited above discloses a method as recited above.

However, Itou et al. fails to disclose wherein the cutting away is controlled by detecting a difference in a material.

Sweeney et al. teaches wherein cutting away is controlled by detecting a difference in a material (col. 4, lines 57-60).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the method of Itou et al. with the detecting and control of Sweeney et al., since one would have been motivated to make such a modification for ensuring appropriate correction (col. 4, lines 57-60) as shown by Sweeney et al.

Furthermore, since the Examiner finds that the prior art contained a "base" method upon which the claimed invention can be seen as an "improvement", and since the Examiner finds that the prior art contained a comparable method that was improved in the same way as the claimed invention, the Examiner finds that one of ordinary skill in the art could have applied the known "improvement" technique in the same way to the "base" method and the results would have been predictable to one of ordinary skill in the art. Therefore, such a claimed combination is obvious.

12. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itou et al. and Sweeney et al. as applied to claim 33 above, and further in view of Smith (US 4590376).

Itou et al. as modified above suggests a method as recited above.

However, Itou et al. fails to disclose wherein a difference in material is detected by monitoring a secondary electron discharge.

Smith teaches wherein a difference in material is detected by monitoring a secondary electron discharge (col. 1, lines 6-12).

It would have been obvious to one having ordinary skill in the art at the time the invention was made, to further modify the method of Itou et al. as modified above with the monitoring of Smith, since one would have been motivated to make such a modification for better monitoring quality (col. 1, line 12) as implied from Smith.

13. Claims 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itou et al. and Sweeney et al. as applied to claim 33 above, and further in view of Iketaki (US 5163078).

Itou et al. as modified above suggests a method as recited above.

However, Itou et al. fails to disclose wherein a difference in material is detected by monitoring an optical change of characteristics, wherein said optical change of characteristics monitored is a change in an optical constant of visible rays or a change based on ellipsometry.

Iketaki teaches wherein a difference in material is detected by monitoring an optical change of characteristics, wherein said optical change of characteristics monitored is a change in an optical constant of visible rays or a change based on ellipsometry (col. 5, lines 25-31).

It would have been obvious to one having ordinary skill in the art at the time the invention was made, to further modify the method of Itou et al. as modified above with the monitoring of Iketaki, since one would have been motivated to make such a modification for better keeping film fabrication within tolerances (col. 5, lines 25-31) as shown by Iketaki.

14. Claims 40, 41, 51, and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itou et al. as applied to claims 39 and 50 above, and further in view of Montcalm et al. (US 6110607).

Itou et al. as recited above discloses a device and method as recited above. Itou et al. further discloses wherein removal of a multilayer film is stopped at a portion of a layer (col. 5, lines 29-31), which creates an outermost layer.

However, Itou et al. fails to disclose an outermost layer having a relatively higher refractive index among layers with different refractive indexes from each other, wherein said layer having a relatively higher refractive index is made of silicon.

Montcalm et al. teaches an outermost layer having a relatively higher refractive index among layers with different refractive indexes from each other, wherein said layer having a relatively higher refractive index is made of silicon (col. 4, lines 25-28).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the device and method of Itou et al. with the outermost layer of Montcalm et al., since one would have been motivated to make such a modification for increasing reflectivity (col. 4, lines 25-28) as shown by Montcalm et al.

15. Claims 45, 47, 56, and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itou et al. as applied to claims 38 and 49 above, and further in view of Ceglio et al. (US 5691541).

16. Regarding claims 45 and 56, Itou et al. discloses a device and method as recited above.

However, Itou et al. fails to disclose wherein said light is an EUV light.

Ceglio et al. teaches wherein light is an EUV light (col. 4, lines 5-20).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the device and method of Itou et al. with the EUV light of Ceglio et al., because of the following rationale.

Since the Examiner finds that the prior art contained a "base" device and method upon which the claimed invention can be seen as an "improvement", and since the Examiner finds that the prior art contained a comparable device and method that was improved in the same way as the claimed invention, the Examiner finds that one of ordinary skill in the art could have applied the known "improvement" technique in the same way to the "base" device and method and the results would have been predictable to one of ordinary skill in the art. Therefore, such a claimed combination is obvious.

17. Regarding claims 47 and 58, Itou et al. discloses a device and method as recited above.

However, Itou et al. fails to disclose wherein said multilayer film is one of a multilayer film formed by pairs of ruthenium and silicon layers, a multilayer film formed by pairs of rhodium and silicon layers, a multilayer film formed by pairs of ruthenium and carbon layers, or a multilayer film formed by pairs of rhodium and carbon layers.

Ceglio et al. teaches wherein said multilayer film is one of a multilayer film formed by pairs of ruthenium and silicon layers (col. 4, lines 5-20), multilayer film formed by pairs of rhodium and silicon layers, a multilayer film formed by pairs of ruthenium and carbon layers, or a multilayer film formed by pairs of rhodium and carbon layers.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the device and method of Itou et al. as recited above with the layers of Ceglio et al., because of the following rationale.

Since the Examiner finds that the prior art contained a device and method which differed from the claimed device and method by the substitution of some element with another element,

and since the Examiner finds that the substituted elements and their functions were known in the art, the Examiner thus finds that one of ordinary skill in the art could have substituted one known element for another, and the results of the substitution would have been predictable. Therefore, such a claimed combination is obvious.

18. Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sweeney et al. in view of Yamamoto et al. (Layer-by-layer design method for soft-x-ray multilayers).

Sweeney et al. discloses an optical element comprising a substrate (fig. 1, #120) having a multilayer film (fig. 1, #110) formed thereon, the substrate having a stack of alternating layers of high refractive index material and low refractive index material in a number of cycles (col. 3, lines 38-40); and a correction film (fig. 1, #130) on the multilayer film (fig. 1, #110), wherein the optical element reflects radiation in a range from vacuum ultraviolet through X-ray (col. 3, lines 32-43).

However, Sweeney et al. fails to disclose wherein a multilayer film stack is formed in a number of cycles larger than that necessary to substantially saturate a reflectance.

Yamamoto et al. teaches wherein a multilayer film stack is formed in a number of cycles larger than that necessary to substantially saturate a reflectance (fig. 9).

It would have been obvious to one having ordinary skill in the art at the time the invention was made, to modify the device of Sweeney et al. with the number of cycles of Yamamoto et al., since one would have been motivated to make such a modification for ensuring that enough reflectance is obtained (fig. 9; and pg. 1629, col. 2, second full paragraph) as implied

from Yamamoto et al., which will maximize the radiation intensity and the efficiency of the system.

Furthermore, since the Examiner finds that the prior art (i.e., Sweeney et al.) contained a "base" device upon which the claimed invention can be seen as an "improvement", and since the Examiner finds that the prior art (i.e., Yamamoto et al.) contained a comparable device that was improved in the same way as the claimed invention, the Examiner thus finds that one of ordinary skill in the art could have applied the known "improvement" technique in the same way to the "base" device and the results would have been predictable to one of ordinary skill in the art. Therefore, such a claimed combination is obvious.

Also note that the method of forming a device (i.e., wherein a portion of the correction film and the stack is cut away in accordance with an amount of adjustment of a wavefront phase of emerging rays) is not germane to the issue of patentability of the device itself. Therefore this limitation has not been given patentable weight. Also note that there is no distinctive structural characteristic claimed that differentiates the optical element as claimed from the prior art.

Allowable Subject Matter

19. Claim 37 is allowed. The following is a statement of reasons for the indication of allowable subject matter.

Regarding claim 37, the prior art fails to disclose or fairly suggest a method for forming an optical element that reflects radiation in a range from vacuum ultraviolet through X-ray, including the step of cutting away a portion of a correction film and a multilayer film stack in

accordance with an amount of adjustment of a wavefront phase of emerging rays, in combination with all the limitations in the claim.

Response to Arguments

20. Applicant's arguments with respect to claims 31-36 and 38-59 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Cheng Glen Kao whose telephone number is (571) 272-2492. The examiner can normally be reached on M - F (9 am to 5 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Chih-Cheng Glen Kao
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Art Unit 2882